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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/660,850	09/13/2000	Marc Laury	859063.478	7939

7590 05/26/2004

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EXAMINER	
CHEN, PO WEI	
ART UNIT	**PAPER NUMBER**
2676	13

DATE MAILED: 05/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/660,850	Applicant(s) LAURY ET AL.	
	Examiner Po-Wei (Dennis) Chen	Art Unit 2676	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

In response to an Amendment received on March 16, 2004. This action is final.

Claims 1-20 are pending in this application. Claims 1, 8, and 15 are independent claims.

The present title of the invention is "Error Distribution for the Approximation of the Pixel Color of a Digital Image".

The Group Art Unit of the Examiner case is 2676. Please use the proper Art Unit number to help us serve you better.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 8-9 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau et al. (US 5,353,127; refer to as "Shiau" herein) in view of Eschbach (US 5,045,952).

3. Regarding claim 8, Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

A method of compressing a digital image having pixels arranged in rows and columns each pixel having a color represented by a color code ("This invention relates to conversion of images from gray scale pixel values to a reduced number of levels pixel values", see lines 6-8 of column 1 and lines 28-50 of column 4 and Fig. 3B; while claim recites rows and columns, it is noted that array of L lines and N pixels for each line form rows and columns);

Selecting, for a current one of the pixels of the digital image, one of a plurality of weighting coefficients based on a position of the current pixel; computing a sum of a correction term and a color code of the current pixel, the correction term being equal to an error value computed for a previous single one of the pixels multiplied by the selected weighting coefficient for the current pixel ("Each pixel of the gray level data is modified by a correspondingly weighted error correction term or terms from previously processed pixels, generating a modified pixel value", see lines 33-37 of column 3 and "...in accordance with a weighted distribution scheme through a matrix...matrix including pixels at pixel locations corresponding to pixels {(n+1,l), (n-2,l+1), (n-1,l+1), (n,l+1)}", see lines 41-48 of column 3). It is noted that while the claim recites "color", this term is broad enough to encompass gray-scale data as used by Shiau. "Color" does not limit the claim to any particular color space. Also see column 4, lines 28-43. While the claim recites previous single one of the pixels, it is noted that Shiau discloses that the error for the current pixels are computed from the evaluation of pixels (n, l-1), (n+1,l-1), (n+2,l-1), (n+3,l-1) and (n-1,l) (see lines 2-8 of column 6 and Fig. 2). Therefore, to compute the error for any pixel in the first line, i.e., l=1, the error for the pixel would be the error of pixel (n-1, l), or the previous single one pixel. Thus, limitation of claim is met;

Selecting for the current pixel an estimated color from a plurality of estimated colors, the selected estimated color being an estimated color that most closely matches the computed sum; and replacing the color code of the current pixel with the selected estimated color ("The modified image, the sum of the input value and the error value of previous pixels (In,l+En,l), is passed to threshold comparator14. The modified image data is compared to threshold value(s) T,

to determine an appropriate output level", see lines 16-20 of column 5 and elements 8, 10, 12, 14, 16 and 18 of Fig. 2).

A correction term for each pixel of each row of the digital image after a first pixel of each row is also equal to an error value computed for previous pixels multiplied by a selected weighting coefficient for a current pixel ("Each pixel of the gray level data is modified by a correspondingly weighted error correction term or terms from previously processed pixels, generating a modified pixel value", see lines 33-37 of column 3 and "...in accordance with a weighted distribution scheme through a matrix...matrix including pixels at pixel locations corresponding to pixels {(n+1,1), (n-2,1+1), (n-1,1+1), (n,1+1)}", see lines 41-48 of column 3; it is noted that the weighted correction term or coefficient is being selected corresponding to the current pixel);

Shiau does not disclose a correction term for each pixel is equal to only the error value computed for a previous single one of the pixels. Eschbach discloses a method for edge enhanced error diffusion utilizing the method (lines 28-52 and Fig. 1 and 3). It would have been obvious to one of ordinary skill in the art to substitute the method of calculating correction term of Eschbach for the method of calculating correction term of Shiau because Eschbach teaches that by utilizing the calculation method will provide a more closely representation of image, to improve the perceived quality of the image (lines 45-52 of column 2).

4. Regarding claim 9, Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

Computing for the current pixel an error value equal to a difference between the computed sum and the color code for the current pixel ("Determining an error term that is a

difference between the output value and the modified optical density value", see lines 48-50 of column 6);

Using the computed error value for the current pixel to compute a correction term for a subsequent one of the pixels ("Each pixel of the gray level data is modified by a correspondingly weighted error correction term or terms from previously processed pixels, generating a modified pixel value", see lines 33-37 of column 3).

5. Regarding claim 13, Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

Digital image is scanned row by row ("An input image of the type to be processed as hereinafter described, may be represented by a series of gray values (gray level pixels) arranged in an array of L lines, each line containing N gray value pixels", see lines 44-47 of column 4 and Fig. 3B; while claim recites row, the term is broad enough to include array of L lines);

The combination of Shiau and Yamada does not disclose the correction term is null for the first pixel of each row. Eschbach discloses a method for edge enhanced error diffusion utilizing the method (lines 28-52 and Fig. 1 and 3; it is noted that the error correction term is being calculated with the error term of preceding pixel E(n-1) and for the first pixel of each row where n=0, I(0), the error correction term would be E(-1) and has null value). It would have been obvious to one of ordinary skill in the art to substitute the method of calculating correction term of Eschbach for the method of calculating correction term of Shiau because Eschbach teaches that by utilizing the calculation method will provide a more closely representation of image, to improve the perceived quality of the image (lines 45-52 of column 2).

6. Regarding claim 14, Shiau discloses a method for quantization gray level pixel data with

extended distribution set comprising:

The weighting coefficient selected for the current pixel is not selected for any pixels that are immediately adjacent to the current pixel ("...in accordance with a weighted distribution scheme through a matrix...matrix including pixels at pixel locations corresponding to pixels {(n+1,l), (n-2,l+1), (n-1,l+1), (n,l+1)}", see lines 41-48 of column 3 and Fig. 3A). The weighting coefficient for the current pixel (In,l) is E while the surrounding pixels are multiples of E.

7. Claims 1 and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau et al. (US 5,353,127; refer to as "Shiau" herein) in view of Yamada et al. (US 6,172,768; refer to as Yamada herein) and Eschbach (US 5,045,952).

8. Regarding claim 1, Shiau, discloses a method for quantization gray level pixel data with extended distribution set comprising:

A method of approximation of respective colors of pixels of a digital image formed of several pixel rows and pixel columns ("This invention relates to conversion of images from gray scale pixel values to a reduced number of levels pixel values", see lines 6-8 of column 1 and lines 28-50 of column 4 and Fig. 3B; while claim recites rows and columns, it is noted that array of L lines and N pixels for each line form rows and columns).

Selecting, successively for each pixel, a color having a code which comes close with a smallest error to a sum of a code of a current pixel's color and of a correction term, wherein the correction term for each pixel of each row of the digital image after a first pixel of each row is equal to the smallest error calculated upon approximation of preceding pixel assigned with a weighting coefficient depending on a position of the current pixel in the image

("Each pixel of the gray level data is modified by a correspondingly weighted error correction term or terms from previously processed pixels, generating a modified pixel value", see lines 33-37 of column 3 and "...in accordance with a weighted distribution scheme through a matrix...matrix including pixels at pixel locations corresponding to pixels {(n+1,1), (n-2,1+1), (n-1,1+1), (n,1+1)}", see lines 41-48 of column 3);

Shiau does not disclose the error calculated upon approximation of only one preceding pixel. Eschbach discloses a method for edge enhanced error diffusion utilizing the method (lines 28-52 and Fig. 1 and 3). It would have been obvious to one of ordinary skill in the art to substitute the method of calculating correction term of Eschbach for the method of calculating correction term of Shiau because Eschbach teaches that by utilizing the calculation method will provide a more closely representation of image, to improve the perceived quality of the image (lines 45-52 of column 2).

The combination of Shiau and Eschbach does not disclose selecting from a look-up table. Yamada teaches a method of halftoning with changeable error diffusion weights which "a look-up table is provided which, based on output error or based on image source data plus its accumulated error, directly provides actual error values and/or threshold or output values for error diffusion halftoning" (see lines 32-36 of column 2). It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Yamada into Shiau. Because by substituting a look-up table for the buffer of Shiau's teaching, it would provide the color code and correction term directly without computation, thus, reduces the processing time. Further, it is very conventional to use look-up tables to implement mathematical functions to speed up the processing.

9. Regarding claim 6, Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

An electronic circuit for approximating the respective colors of pixels of a digital image (see Fig. 2).

10. Regarding claim 7, Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

A memory in which are stored codes of colors, coded in the same way as the pixel colors; an evaluation circuit having a first input that receives a color code from the memory and a second input that receives the code of a pixel of the image plus a correction term, the evaluation circuit selecting the stored color having the code that comes close with the smallest error; and a correction circuit, an input of which is connected to an output of the evaluation circuit, for generating a corrected code, equal to the sum of the code of the color of a current pixel and of the correction term ("The modified image, the sum of the input value and the error value of previous pixels (In,l+En,l), is passed to threshold comparator 14. The modified image data is compared to threshold value(s) T, to determine an appropriate output level", see lines 16-20 of column 5 and elements 8, 10, 12, 14, 16 and 18 of Fig. 2);

The combination of Shiau and Eschbach does not disclose selecting from a look-up table. Yamada teaches a method of halftoning with changeable error diffusion weights which "a look-up table is provided which, based on output error or based on image source data plus its accumulated error, directly provides actual error values and/or threshold or output values for error diffusion halftoning" (see lines 32-36 of column 2). It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Yamada into Shiau. Because by

substituting a look-up table for the buffer of Shiau's teaching, it would provide the color code and correction term directly without computation, thus, reduces the processing time. Also, see the remarks, above, presented with regard to claim 1.

11. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US 5,353,127), Eschbach (US 5,045,952) and Yamada (US 6,172,768) as applied to claim 1 above and further in view of Matsushiro (US 6,459,817).

Regarding claim 2, it is noted that the combination of Shiau, Eschbach and Yamada does not disclose that the "weighting coefficient is a function of respective least significant bits of binary codes representing an abscissa and an ordinate of the position of the current pixel". However, this is known in the art as taught by Matsushiro. Matsushiro teaches an image-processing method and apparatus generating pseudo-tone patterns with improved regularity that "Table T1 is addressed by the least significant bit of the x-coordinate, and the least significant bit of the y-coordinate" and "the values Kj(x,y) of the four periodic functions (j=1,2,3,4) at coordinates (x,y) are obtained from tables T1,T2,T3,T4 (step5). These values Kj(x,y) are multiplied by corresponding weights Wj(I(x,y)) obtained from the weighting table", see lines 58-60 of column 5 and lines 37-41 of column 7 and Fig. 7)

It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Shiau and Yamada into Matsushiro. Because by substituting weighting coefficient as a function of respective least significant bits of binary codes representing an abscissa and an ordinate of the position of the current pixel, it would "cause dots to appear preferentially in predetermined positions, which have a regular periodic pattern. Dot noise is thereby reduced"

(see lines 61-63 of column 1, Matsushiro). Further, each of the references are in the same field and use weighting coefficients to modify pixel values.

12. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US 5,353,127), Eschbach (US 5,045,952),Yamada (US 6,172,768) and Matsushiro (US 6,459,817) as applied to claim 1 above and further in view of Suzuki et al. (US 6,476,824; refer to as "Suzuki" herein).

Regarding claim 3, Shiau discloses that the weighting coefficient is chosen from among a first and a second value ("...quantization of the nth pixel in scan line l (i.e. pixel n,l) with error diffusion to a matrix including pixels at pixel locations corresponding to pixels {(n+1,l)...Distribution weighting may be in accordance with the scheme {(n+1,l)=0.5, (n+1,l+1)=0.125..." see lines 22-27 of column 3 and Fig. 3A);

The combination of Shiau, Eschbach, Matsushiro and Yamada does not disclose the least significant bit of the abscissa of the position of the current pixel is null and when respectively, the least significant bit of the ordinate of the position of the current pixel is null or equal to one, and from among a third and a fourth value when the least significant bit of the abscissa of the position of the current pixel is equal to one and when respectively, the least significant bit of the ordinate of the position of the current pixel is null or equal to one. However, it is known in the art taught by Suzuki et al., hereafter Suzuki. Suzuki discloses a luminance resolution enhancement circuit and display apparatus using same that "For each pixel in each field, the dither signal generator16 receives the relative horizontal coordinate (h) from the horizontal address generator 12, the relative vertical coordinate (v) from the vertical address generator 13, the relative temporal coordinate (f) from the field address generator 14, and the average value (a)

calculated by the weighted averaging circuit 15", see lines 30-36 of column 7 and Figs. 5 and 18). As seen in Fig. 18, when "h"=0, the weight is 0 or 3 and when "h"=1, the weights is 2 or 1, thus meet the claim language.

It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Shiau, Eschbach, Yamada and Matsushiro into Suzuki. Because by substituting the weighting pattern of Susuki would "improve the quality of a digital image" (see line 23 of column 2, Suzuki). Further, this pattern is simply an alternative to the similar pattern for weighting used by the other references.

13. Regarding claim 4, the combination of Shiau, Eschbach, Yamada and Matsushiro does not disclose the specific values for the coefficients, though examples of values are used by Shiau as seen in Figs. 3A-B. Further, these values are conventional choices for weighting coefficients in error diffusion/dispersion systems. Further, there is no disclosed criticality to these specific values. Therefore, to one of ordinary skills in the art to select these conventional values as a matter of routine choice.

14. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US 5,353,127), Eschbach (US 5,045,952) and Yamada (US 6,172,768) as applied to claim 1 above and further in view of Ishikawa et al. (US 6,356,361; refer to as Ishikawa herein).

15. Regarding claim 5, Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

Image is scanned row by row ("An input image of the type to be processed as hereinafter described, may be represented by a series of gray values (gray level pixels) arranged in an array

of L lines, each line containing N gray value pixels", see lines 44-47 of column 4 and Fig. 3B; while claim recites row, the term is broad enough to include array of L lines);

The combination of Shiau, Eschbach and Yamada does not disclose the correction term is null for the first pixel of each row. Ishikawa discloses an image processing method using error diffusion utilizing the method (lines 15-31 of column 6 and Fig. 4; it is noted that the error correction term is being calculated with the error term of preceding pixel E(x-1,y) and for the first pixel of each row I(0,y), the error correction term would be E(-1,y) and has null value). It would have been obvious to one of ordinary skill in the art to utilize the teaching of Ishikawa to provide increase in the processing speed without degrading the essential resolution and gradation of the error diffusion method (lines 1-4 of column 3, Ishikawa).

16. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US 5,353,127) and Eschbach (US 5,045,952) as applied to claim 8 above and further in view of Matsushiro (US 6,459,817).

17. Regarding claim 10, the statements presented, with respect to claim 2 above are incorporated herein.

18. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US 5,353,127), Eschbach (US 5,045,952) and Matsushiro (US 6,459,817) as applied to claims 8 above and further in view of Suzuki (US 6,476,824).

19. Regarding claims 11 and 12, the statements presented, with respect to claims 3 and 4 are incorporated herein.

20. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US 5,353,127) and Eschbach (US 5,045,952) as applied to claim 8 above and further in view of Ishikawa et al. (US 6,356,361; refer to as Ishikawa herein).

21. Regarding claim 13, the statements presented, with respect to claim 5 are incorporated herein.

22. Claims 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US 5,353,127) and further in view of Itoh et al. (US 4,982,292; refer to as Iton herein) and Eschbach (US 5,045,952).

23. Regarding claims 15, 16, 19 and 20 Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

A method of compressing a digital image having pixels arranged in rows and columns and each pixel having a color represented by a color code ("This invention relates to conversion of images from gray scale pixel values to a reduced number of levels pixel values", see lines 6-8 of column 1 and lines 28-50 of column 4 and Fig. 3B; while claim recites rows and columns, it is noted that array of L lines and N pixels for each line form rows and columns);

Assigning a variable first correction coefficient to pixels in the digital image, the first correction coefficient being based on a position of its corresponding pixel, for each of the pixels, selecting an estimated color of a plurality of estimated colors, the selected estimated color being selected based on the color of the pixel and the first correction coefficient; Assigning a variable second correction coefficient pixels in the digital image, the second correction coefficient being based on a position of its corresponding pixel, for each of the pixels, selecting an estimated color of the plurality of estimated colors, the selected estimated color for the pixel being selected based

on the color of the pixel and the second correction coefficient; Assigning a third correction coefficient to pixels in the digital image, selecting an estimated color of the plurality of estimated colors, the selected estimated color for the pixel being selected based on the color of the pixel and the third correction coefficient; Assigning a fourth correction coefficient to pixels in the digital image, selecting an estimated color of the plurality of estimated colors, the selected estimated color for the pixel being selected based on the color of the pixel and the fourth correction coefficient; obtaining a correction term, for each current pixel of each row after the first pixel of each row, that is based on a computed error value of the pixels previous to the current pixel ("...quantization of the nth pixel in scan line l (i.e. pixel n,l) with error diffusion to a matrix including pixels at pixel locations corresponding to pixels {(n+1,l), (n-2, l+1), (n-1,l+1), (n,l+1)}. Distribution weighting may be in accordance with the scheme {(n+1,l)=0.5,(n+1,l+1)=0.125,(n-1,l+1)=0.125,(n,l+1)=0.25}", see lines 22-28 of column 3 and Fig. 3A; It is noted that "Each pixel of the gray level data is modified by a correspondingly weighted error correction term or terms from previously processed pixels, generating a modified pixel value. This modified pixel value is compared to a set of threshold values, where the comparison determines that the output will be one of a limited number of output levels", see lines 33-40 of column 3). Therefore, the distribution weighting varies depending on the position of the current pixel (n,l). And the correction coefficient varies depending on the distribution weighting. It is further noted that while the claim recites "color", this term is broad enough to encompass gray-scale data as used by Shiau. "Color" does not limit the claim to any particular color space. Also see column 4, lines 28-43;

Shiau does not disclose the error value computed of only a single one of the pixels previous to the current pixel. Eschbach discloses a method for edge enhanced error diffusion utilizing the method (lines 28-52 and Fig. 1 and 3). It would have been obvious to one of ordinary skill in the art to substitute the method of calculating correction term of Eschbach for the method of calculating correction term of Shiau because Eschbach teaches that by utilizing the calculation method will provide a more closely representation of image, to improve the perceived quality of the image (lines 45-52 of column 2).

Shiau does not disclose that the pixels are in 4 different groups, the pixels of the first group are not contiguous with each other, the pixels of the second group are not contiguous with each other, the pixels of the first group alternate with the pixels of the second group in the digital image, the pixels of the first and second groups alternate with each other in a first line of the digital image and the pixels in the third and fourth groups alternate with each other in a second line of the digital image, the second line being immediately adjacent to the first line. Itoh teaches a method and apparatus for processing pel signals of an image which "the original images are stored in pel positions in an input image buffer and the pel signals stored in every other pel (EOP) positions in the input buffer are sequentially fetched, along with respective pluralities of neighboring pel signals stored in EOP positions and compressed by adaptive arithmetic compression to generate a first set of compressed data which is stored in a memory" (see lines 2-9 of abstract). Also, Fig. 5 shows the different positions of the pixels in different groups. The pixels represented by double circles can be considered as first group, "X1" can be considered as second group, "X2 can be considered as third group and "X3 can be considered as fourth group. Thus, the pixels of the first group are not contiguous with each other, the pixels of

the second group are not contiguous with each other, the pixels of the first group alternate with the pixels of the second group in the digital image, the pixels of the first and second groups alternate with each other in a first line of the digital image and the pixels in the third and fourth groups alternate with each other in a second line of the digital image, the second line being immediately adjacent to the first line. It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Itoh into Shiau. Because by utilizing the teaching of Itoh of separating the pixels in different groups depending on the positions of the pixels, it provides "a remarkable reduction in the volume of compressed data required for representing an original image" (see lines 37-39 of column 2).

24. Regarding claim 17, Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

Selecting an estimated color for each pixel of the first group includes, for each pixel of the first group, computing a sum of a correction term and a color code of the pixel, the correction term being equal to an error value computed for a previous single one of the pixels of the digital image multiplied by the first correction coefficient; the selected estimated color for the pixel being the estimated color that most closely matches the computed sum ("Each pixel of the gray level data is modified by a correspondingly weighted error correction term or terms from previously processed pixels, generating a modified pixel value. This modified pixel value is compared to a set of threshold values, where the comparison determines that the output will be one of a limited number of output levels", see lines 33-40 of column 3 and "Shift registers 40, 42, 44 and 46, respectively corresponding to past error buffers 32, 34, 36 and 38 are available to provide a bit shifting arrangement which shifts the binary value representing the

error a number of places corresponding to multiplication by 0.0625, 0.0625, 0,125 and 0.25 respectively" see elements 32, 34, 36, 38, 40, 42, 44 and 46 of Fig. 2 and Fig. 3B). While the claim recites previous single one of the pixels, it is noted that Shiau discloses that the error for the current pixels are computed from the evaluation of pixels (n, l-1), (n+1,l-1), (n+2,l-1), (n+3,l-1) and (n-1,l) (see lines 2-8 of column 6 and Fig. 2). Therefore, to compute the error for any pixel in the first line, i.e., l=1, the error for the pixel would be the error of pixel (n-1, l), or the previous single one pixel. Thus, limitation of claim is met;

25. Regarding claim 18, Shiau discloses a method for quantization gray level pixel data with extended distribution set comprising:

For each pixel of the first group, computing an error value equal to a difference between the computed sum for the pixel and the color code for the pixel and using the computed error value for the pixel to compute a correction term for a subsequent one of the pixels of the digital image ("The difference value between the modified pixel value and the output pixel value is distributed in accordance with a weighted distribution scheme through a matrix comprising a set of neighboring unprocessed pixels", see lines 40-44 of column 3).

Conclusion

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Chang (US 6,496,603) discloses a method of enhanced error diffusion using error value from previous pixel.

Takahashi (US 5,479,538) discloses error diffusing method using error value from previous pixel.

27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Inquiry

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Po-Wei (Dennis) Chen whose telephone number is (703) 305-8365. The examiner can normally be reached on 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew C Bella can be reached on (703) 308-6829. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Po-Wei (Dennis) Chen
Examiner
Art Unit 2676

Po-Wei (Dennis) Chen
November 5, 2003

Matthew C. Bella

MATTHEW C. BELLA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600